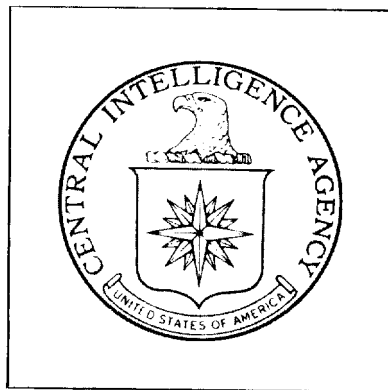


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# *Imagery Analysis Report*

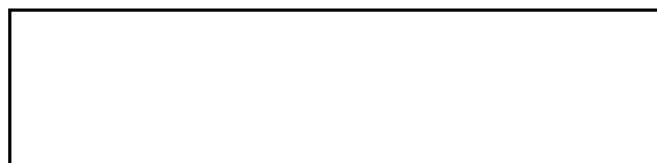
Almalyk Copper Complex

USSR

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## ALMALYK COPPER COMPLEX

### SUMMARY

The Almalyk Copper Complex, located near Tashkent, is one of the major copper producers within the Soviet Union. When this complex was first observed on satellite photography [REDACTED] only the concentration plant was complete. The smelter and electrolytic cell building were first observed complete and operating [REDACTED] An air separation plant and a sulfuric acid plant were added [REDACTED]

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It is estimated that the complex can produce approximately 140,000 tons of refined copper per year.

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ALMALYK COPPER COMPLEX  
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INTRODUCTION

The Almalyk Copper Complex [REDACTED] is located at 40-50-20N 069-33-45E (Figure 1) approximately 75 nautical miles south of Tashkent, USSR.

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This complex was studied using all available photographic coverage [REDACTED]. The purpose of the report is to identify, measure, provide a chronological analysis of the existing facilities, and to determine the production capacity of refined copper.

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DISCUSSION

The Almalyk Copper Complex is rail and road served and occupies a rectangular area of approximately 460 acres. The complex has facilities for ore concentration, smelting, and refining. Other facilities include an air separation plant, steam plant, sulfuric acid plant, and numerous support and storage buildings. Descriptions and dimensions of the major structures are listed in Table 1, which is keyed to Figure 4.

When the complex was first observed on [REDACTED] photography [REDACTED] the ore concentration plant was the only completed portion. It is suspected that this plant was operating and shipping the ore concentrate to other smelters. The smelter and the electrolytic cell building were complete and operating when first observed on photography [REDACTED]. The following discussions describe the main production components.

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Ore Concentration Plant

Copper ore is delivered by rail car to Building 22. The ore is crushed and ground in Buildings 15, 16, and 17 before it is conveyed to the storage and blending building (Item 18). The finely ground ore is combined with reagents in the concentration building (Item 14). Different reagents are used to separate copper and molybdenum. The dried molybdenum concentrate is stored in silos (Item 11), to await shipment. The copper concentrate is conveyed to the nearby roasting building.

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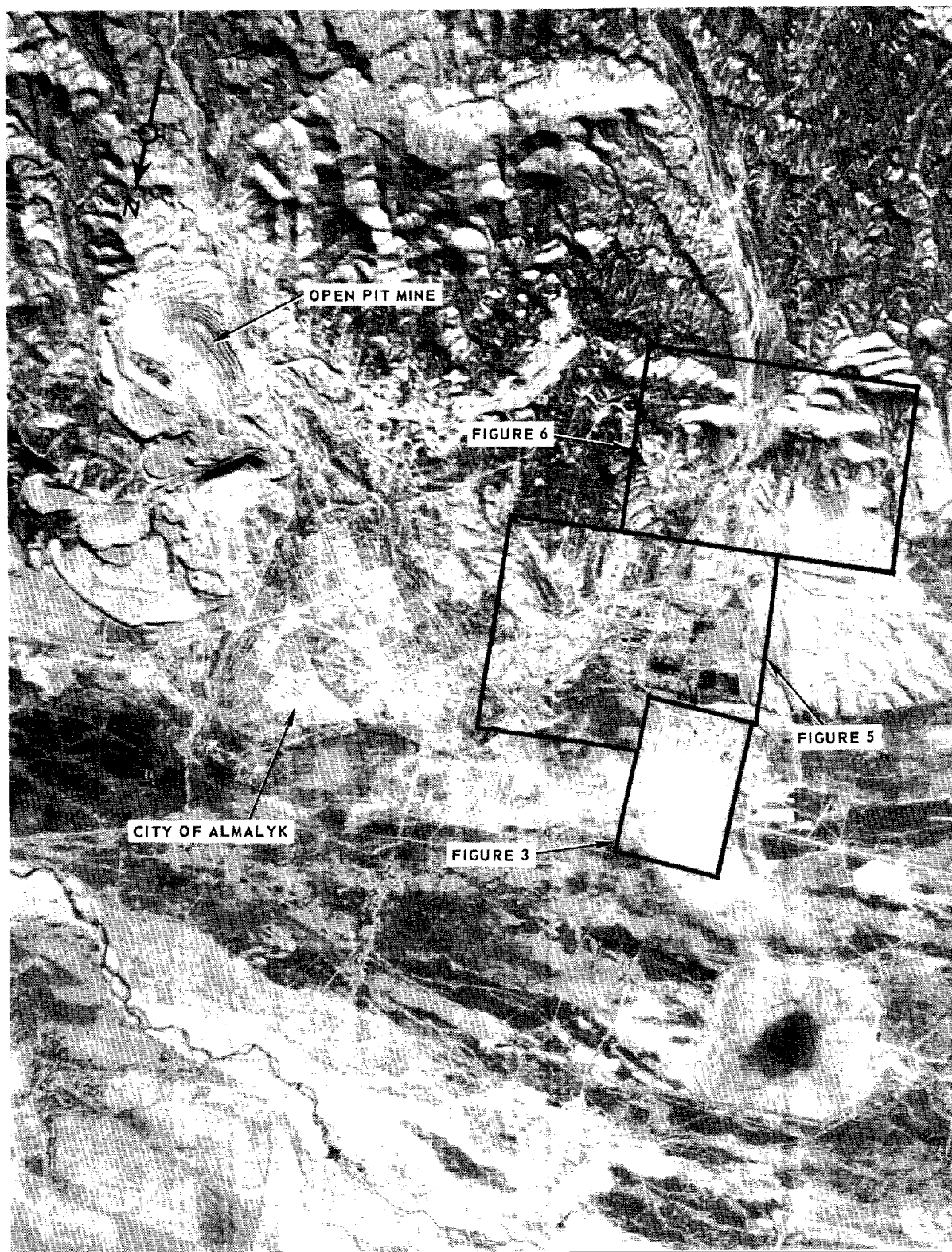


FIGURE 2. ALMALYK NON-FERROUS METALS COMPLEX

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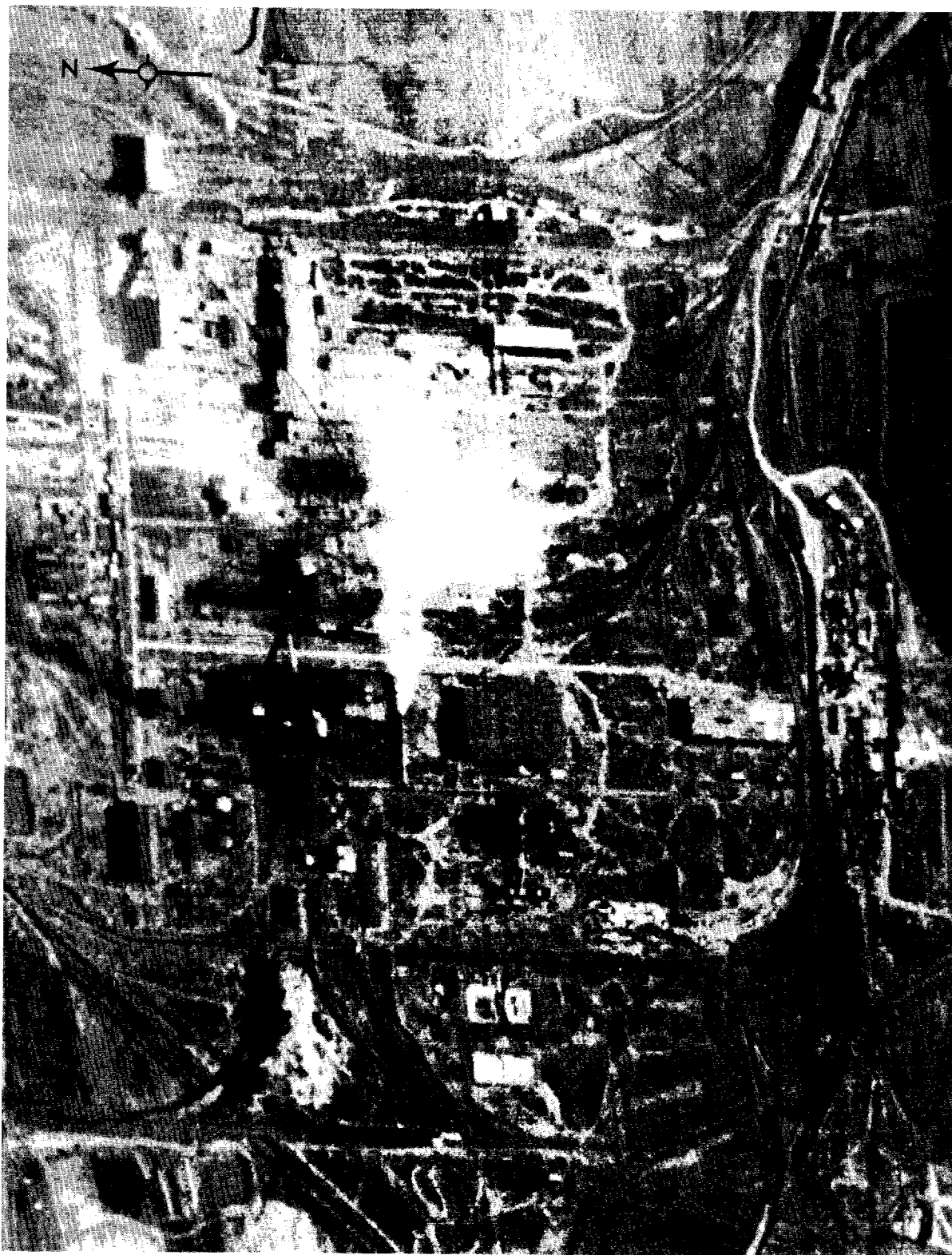


FIGURE 3. ALMALYK COPPER COMPLEX.

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**TABLE I. ALMALYK COPPER COMPLEX**

ITEM	DESCRIPTION	DIMENSIONS (ft)
1	Support Building	200 X 100
2	Steam Plant	175 X 80
3	Warehouse	400 X 95
4	Reverberatory Furnace Section	300 X 175
5	Converter Section	700 X 120
6	Casting Section	400 X 90
7	Electrolytic Cell Building	500 X 350
8	Warehouse	550 X 175
9	Blending Building	350 X 45
10	Roasting Building	230 X 190
11	Storage Silos	
12	Administration Building	Irregular
13	Workshop	190 X 90
14	Concentration Building	1750 X 520
15	Secondary Crushing Building	230 X 90
16	Primary Crushing Building	110 X 90
17	Grinding Building	230 X 120
18	Storage and Blending Building	550 X 115
19	Warehouse	470 X 95
20	Warehouse	320 X 95
21	Reagent Storage Building	420 X 100
22	Receiving and Crushing Building	250 X 75

Smelter

The copper concentrate is roasted in Building 10 to remove the impurities such as sulfur, arsenic, and bismuth. The roasted concentrate is conveyed to the adjacent blending building (Item 9) where limestone is added to act as a flux during smelting. The concentrate is charged into reverberatory furnaces (Item 4) where it is reduced to copper matte and slag.

The slag is tapped off at frequent intervals and taken while still in a molten state to the nearby slag dumps. The copper matte is continuously withdrawn from the furnace and transported to the converter section (Item 5). The matte is charged into the converters where oxygen from the air separation plant is blown through it, driving off the impurities to form blister copper. The blister copper is charged into anode furnaces for further reduction of impurities. The copper is then tapped and cast into anodes for refining in the electrolytic cell building (Item 7).

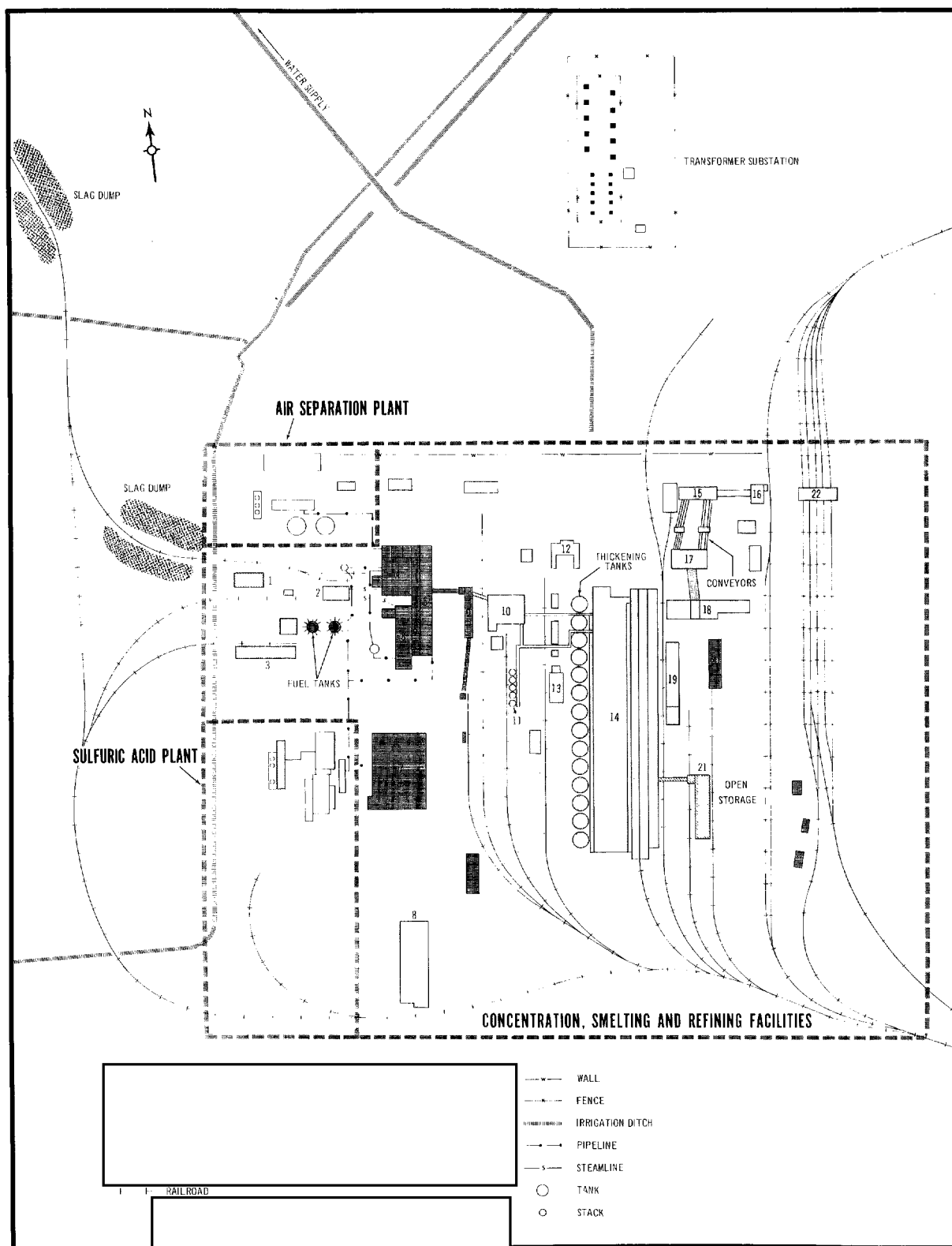
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FIGURE 4. ALMALYK COPPER COMPLEX

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### Electrolytic Cell Building

The anodes are positioned in the cells which are filled with an electrolyte solution of copper sulphate and sulfuric acid. The passage of direct current through the cells causes the copper to pass from the anode, through the solution, to the cathode where it is deposited as pure copper. The cathodes are then removed, melted and cast into commercial shapes, ready for shipment to rolling or fabricating mills. Impurities or by-products settle to the bottom of the cells. These by-products contain rare metals which are recovered. However, no by-products recovery section could be identified at this plant.

### Other Facilities

Other facilities within the complex include a sulfuric acid plant located adjacent to the electrolytic cell building. The plant utilizes the sulfur dioxide from the reverberatory furnaces and converters. A transformer substation is located north of the concentration plant and transforms the power needed to operate the complex. The support area (Figure 5) located on the northwest edge of the city of Almalyk contains facilities for the maintenance, repair, and storage of mining vehicles and equipment. There is another concentration plant (Figure 6) located approximately 3 nautical miles south of the copper complex. It is probably used for the processing of zinc and lead ores.

### Production Capacity

From a comparison of US copper refining plants it was found that a ratio exists between the size and production capacities of their electrolytic cell buildings. Using this ratio as the base, it is estimated that the electrolytic cell building located within the Almalyk Copper Complex can produce approximately 140,000 tons of refined copper per year.

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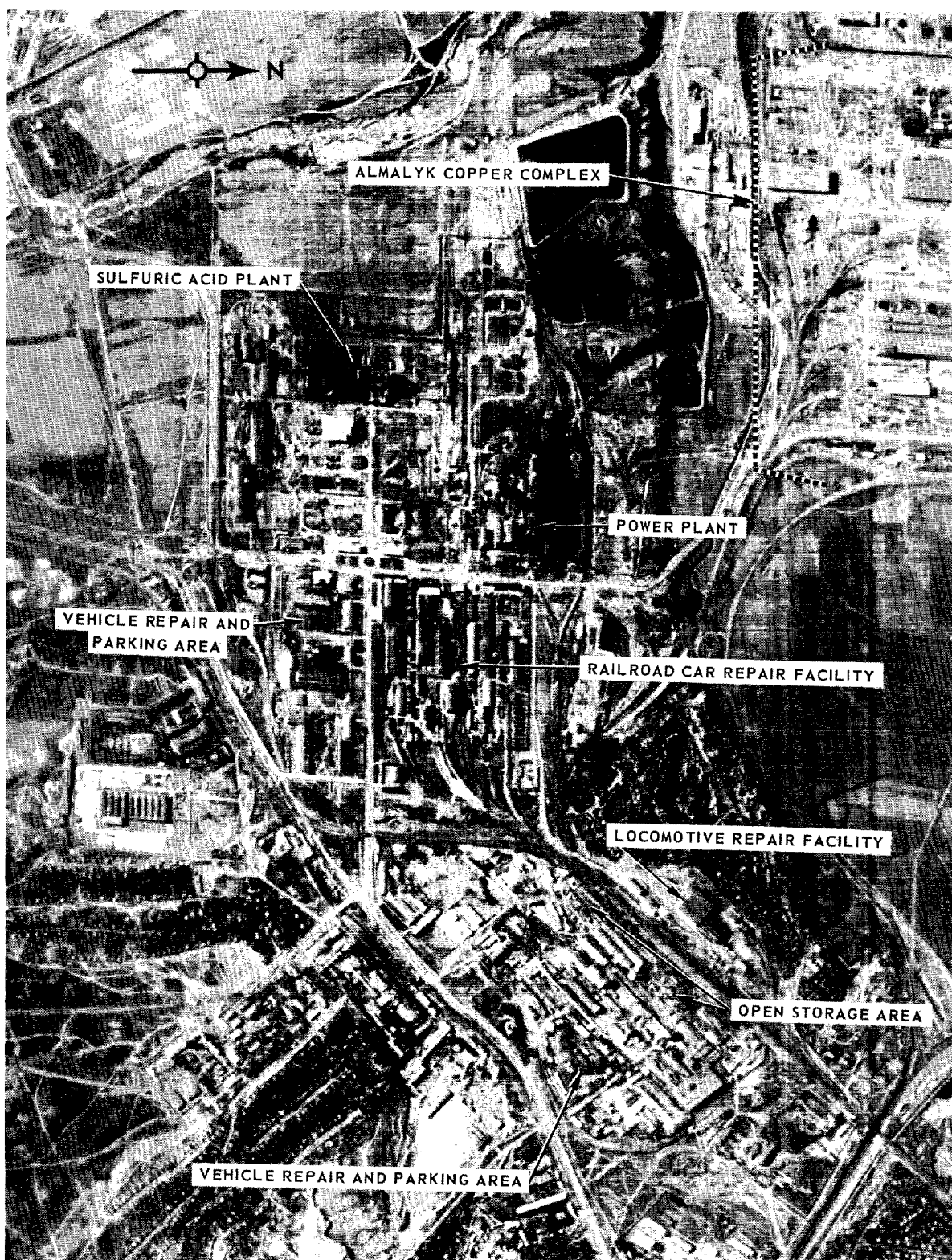


FIGURE 5. ALMALYK SUPPORT AREA

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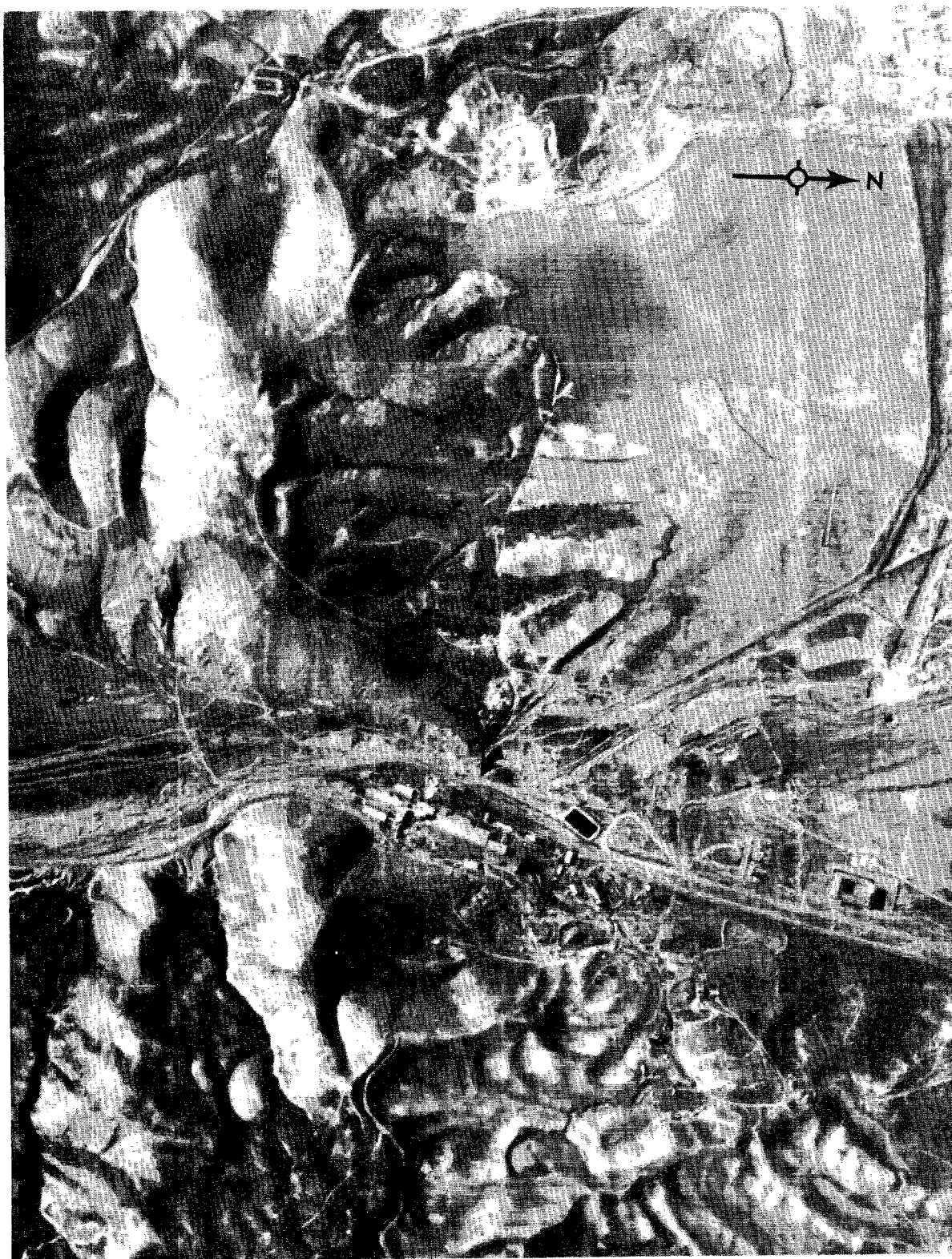


FIGURE 6. ALMALYK PROBABLE ZINC AND LEAD CONCENTRATION PLANT,

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